Health comes first: Smart heuristics to stay healthy

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Abstract

In the classical "jacket-calculator" dilemma it is postulated decision is regulated by a mental topical accounting process which orients people to consider a discount price when purchasing items. We proposed an adapted version of the classical "jacket-calculator" task re-framing the choice in a medical context. Our results supported the view that simple minimal mental accounts influence evaluation and choice in the medical context where time, instead of price, represents a fundamental cue of the decision analysis. The decision process adopted by participants tended to be associated with a lexicographic decision mechanism where "time" appears the most effective cue of a "take-the-best" heuristic to predict people's behaviour accurately. These findings broaden the body of evidence indicating that bounded rationality in human decisions is intrinsically connected with the decisional context and different contexts may elicit different mental accounting strategies. In addition, the study stressed the need to enhance the dialogue between the more recent paradigm of the ecological rationality with the classical interpretations of bounded rationality because the two paradigms, not rarely opposed to each other, can provide hints to the interpretation of the decision process, with practical considerations for future interventions in health education and public health.

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Introduction

As reported by institutional bodies and health policy regulations, citizens' involvement in health decisions is becoming more and more prominent in our contemporary society (Coulter et al., 2008; Petrocchi et al., 2019). People can have a considerable role in understanding the causes of illness, managing their health, and taking appropriate actions (Boger et al., 2015). This role must be acknowledged and supported. To do that, comprehending thinking strategies and mental reasoning is cardinal. In this view, the inspirational work by Richard Thaler (1999) on mental accounting in economic decisions provide us interesting suggestions for health decision processes.

Thaler (1999) argued that, to analyse different options, people create a mental account that details the advantages and disadvantages associated with each option. Mental (or, alternatively, psychological) accounting can be defined as the process whereby people code, categorise, and evaluate alternatives and possible outcomes. Thaler (1999) suggested that three types of mental accounting could be employed: a minimal account, a topical account, and a comprehensive account. The *minimal* account includes "only the differences between two options disregarding all the other features" (Thaler, 1999, p. 186). For instance, if you want to buy a car and you wish a station wagon model, you can decide to buy a station wagon disregarding all the other cars available in a car market. The *topical* account relates "the consequences of possible choices to a level of reference that is determined by the context within which the decision arises" (Thaler, 1999, p. 186). More simply, the topical account's decision process is related with the frame (the context) one person chooses to use. For example, in relation with the frame considered (e.g., risk, classification of expenditure), you may opt for a station wagon or for another car model. The *comprehensive* account explores all possible factors, including current resources, future remuneration, and possible outcomes of other likely results. Coming back to the previous example, if you want to buy a car, you will evaluate all possible models comparing benefits, options, and advantages before to take a decision. Whereas the traditional economic theory generally assumes that people make decisions using the comprehensive account, classical behavioural-economics

tasks have shown that people tend to use topical account strategies because human mind is characterised by bounded rationality (Simon, 1991).

The topicality of mental accounting is illustrated by the example of the "jacket-calculator task" (Kahneman and Tversky, 2013). In this task, most people are inclined to travel to save $5 when the cost of an article is low ($15) but not when it is high ($125). People do not calculate the combined price of the two articles when judging the amount of the discount. Instead, they judge it in relation to the full price of the discounted product (Kahneman, 2003). They use different mental accounts for the jacket and the calculator because they represent different objects: When the discount is applied to a low-cost product, it has a more considerable impact on the final price and is perceived as more attractive (Ariely, 2009). The jacket-calculator task demonstrates that mental accounting is both piecemeal and topical.

The jacket-calculator task and its implications have been considered mainly in the field of economic decisions. Our goal was to test whether the decision mechanism which operates in such a task is also valid in the field of health. This is a highly substantive and emotionally meaningful context where decisions do not always follow the traditional rules of classical experiments (Gong et al., 2013; Iannello et al., 2015; Patel et al., 2002; Renzi et al., 2016; Riva et al., 2015). Based on that consideration, we hypothesised that people would applied a different mental accounting when faced with health decisions. More specifically, we conjectured that the use of a minimal accounting as decisions in health should be perceived as meaningful and urgent and should require a very quick action. We also want to study whether the mental accounting in health decisions is supported by the use of a specific/or a specific set of heuristics.

We used an adapted version of the "jacket-calculator" experiment developed by Tversky and Kahneman (1981) in a medical choice context. The overall aim was to evaluate the decision processes undertaken by people in such a context and to identify the presence of relevant reasons that affect the decisional path.

Study 1

Procedure

Participants were recruited via online advertisements posted on the university website (intranet) and on the Facebook page of the University in Milan (Italy). Students were all graduated (bachelor degree) and they were all enrolled in a postgraduate course of the Health Science curriculum.

Participants were presented the experiment in a written form using single sheet for each person. Each sheet contained questions about participants' socio-demographic data and information about the experiment.

All procedures performed were in accordance with the ethical standards of the Institution and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent was obtained from all individual participants.

Methods

One hundred and forty-eight undergraduates volunteered. Most participants were females, young, and without the presence of longstanding illness (Table 1).

Table 1 – *Participants' characteristics of Study 1*

Socio-demographics data	*N*	*Mean (Min-Max) or %*
Gender		
Male	52	35%
Female	96	65%
Age		25.9 (22-46)
Long standing disease*	3	2%
Total	148	

*A condition lasting six months or longer (including chronic conditions)

The task was a variant of the classical jacket-calculator experiment and a within-subject design with two conditions (drug vs. ECG visit) at two times points (to avoid testing effect simply recalling the information from) was implemented.

In phase 1 we asked the participants to perform the following written task: *"Imagine that you are about to purchase an over-the-counter drug for (€125)[€15] and an electrocardiogram (EGC) visit for (€15)[€125]. The pharmacist informs you that the over-the counter-drug/the EGC you*

wish to buy is on sale for (€10)[€120] at another branch of the store, located 20 minutes away by car. Would you make the trip to the other store?"

In phase 2 we asked participants who were not inclined to drive to the other shop to justify their decision by choosing the most relevant reason(s) among: a) time saving, b) small discount value, c) immediate availability (drug product/service), d) no familiarity with the other shop, and e) no satisfactory information about the other shop (i.e., address, name). Participants were asked to choose at least one reason, however they were free to select from 1 to 5 reasons.

Out of the 148 participants, half of them performed the decisional task with the figures in parentheses (*condition a*), whereas the other half performed the task with the figures in brackets (*condition b*). Results were then aggregated.

Results

In both versions of the dilemma most people reported they would not travel to save €5 when the item costed €15 nor when it costed €125 both for *condition a* and *condition b* (Table 2). The percentage of people inclined to drive for a discounted over-the-counter drug was 15.4%, whereas for an EGC visit the number was 11% (difference = 4.4 %, 95% CI [-4.16 to 12.98]; p =.307).

Table 2 – *Percentage of participants available to travel to another shop*

	Condition a	*Condition b*
Over-the- counter drugs	5.0	10.4
EGC	5.0	6.0

Table 3 reveals that time saving was considered as the cause of the decision in the great majority of cases, whereas immediate possession of the item and no information about the alternative shop were selected but with less frequency. The other cues were either minimally considered or not selected. About three-quarters of the sample (N = 111, 75%), selected only one reason and, among these reasons, time saving was chosen with great majority (75 times, 68%)

Table 3 – *Reasons considered in Study 1*

Reasons	Selection (N)	%
Time saving	114	77.2
Small discount value	3	1.5
Immediate availability	61	41.5
No familiarity with the other shop	0	0.0
No enough information about the alternative shop	30	20.8
Other reasons	0	0.0

*Condition a and b data are aggregated

Study 2

Methods

Study 1 showed that the decisional analysis is nor influenced nor by the type of the item (over -the counter drug or EGC), nor by the initial price of the item (high or low). Study 1 also highlighted the tendency for people to focus on specific reasons to take a decision in the medical context. Study 2 examined whether this tendency changed when a higher discount was offered. All the students enrolled in Study 1 were asked to participate also in Study 2. The day after, 131 students were available to perform the second study (Table 4). Their first task was to decide whether it was worth buying an over-the counter-drug €7 cheaper in a pharmacy that was 15 minutes away. Their second task was to decide whether to accept an offer to get an EGC visit €7 cheaper in a pharmacy also located 15 minutes away. At the end of the task people who decided not to change pharmacy were asked to justify their choice (similarly to Study 1). Informed consent was obtained from all individual participants.

Table 4 – *Participants' characteristics of Study 2*

Socio-demographics data	*N*	*Mean (Min-Max) or %*
Gender		
Male	43	33%
Female	88	67%
Age		24.5 (22-29)
Long standing disease	0	
Total	131	

Results

Like in Study 1, most people decided not to travel to another pharmacy for a discounted over-the-counter drug nor for a discounted ECG visit. However, the percentage of people who decided to travel to another shop was higher: 21% for the over-the-counter drug and 13.8% for the EGC visit (Difference: 7.2%, 95% CI [-6.01 to 20.23]; p = .280). Most participants (both for the choice of the over-the counter drug and the EGC) justified their choice in terms of time saving (89.1%), followed by immediate availability (40.8% of cases) and no information about the alternative shop (15.1%). Table 5 shows the frequency with which cues were selected.

Table 5 – *Reasons considered in Study 2*

Reasons	*Selection N*	*%*
Time Saving	117	89.1
Small Discount value	0	0.0
Immediate availability	53	40.8
No familiarity with the other shop	0	0.0
No enough information about the alternative shop	20	15.1
Other reasons	0	0.0

*Over-the counter drugs and EGC data are aggregated

Similarly to Study 1, the majority of the participants (N = 78, 60%) considered "time saving" as the most important reason.

In order to better understand the decision process adopted by our participants we tried to graphically describe the decisional tree corresponding to the responses recorded in the two experiments. We attributed the value 1 if the reason was selected whereas we attributed the value 0 if the reason was not considered. According to our results, the decision process adopted by our participants was very easy and rapid and it was represented by a lexicographic strategy. A lexicographic strategy means that people tend to categorize each reason according to a level of consideration (=1). If one reason is selected, it means that it is considered highly relevant to make the choice. In other words, a person using a lexicographic strategy evaluates the most important attribute and, if such attribute (i.e., *reason* in our study) is evidently superior to others, he/she stops the decision process and makes the decision. Otherwise, he/she continues to the next most important attribute.

In our investigation people considered particularly relevant one reason, that is, "time saving". The selection of this one single reason was satisfactory to make a choice for the 68% of cases in Study 1 and for the 60% of cases in Study 2. Figure 1 describes the typical decisional path followed by our participants.

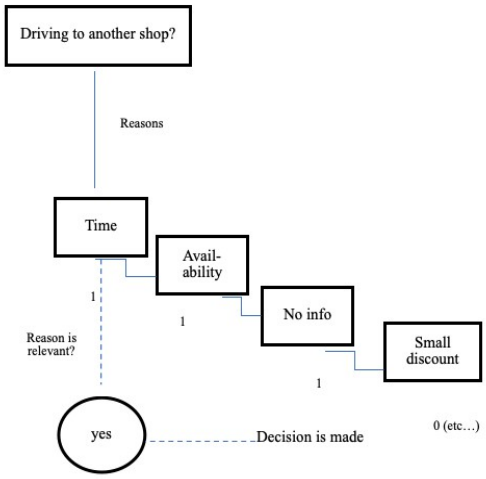

Fig.1 – *Decisional Path*

More specifically, this lexicographic strategy is called "take-the-best". In using this heuristics, judgments are based on a single "good" reason only, ignoring other attributes (reasons).

Discussion and Conclusions

Kahneman and Tversky's (1981) theory focuses on the ways in which individuals compare various possible alternatives to make decisions. This involves referring to specific categories of mental accounts. Whereas the comprehensive account incorporates all possible factors including advantages and benefits (and represents the typical strategy used by classical economic theory), topical and minimal accounting models represent the typical strategy used by humans through the application of bounded rationality. A topical account relates the consequences of possible choices to a reference level determined by the context, whereas a minimal account examines only the differences between choices. In behavioural economics and behavioural consumption studies, experimental evidence suggests that the most widespread attitude corresponds to the so-called topical account (Duxbury et al., 2005; Godek et al., 2012; Thaler, 1999). According to this claim, participants in our experiments should have chosen to travel to another branch of the store to save 5 euros. Contrary to expectations, our study suggested that, in the context of health, the decisional path is even shorter and more rapid. In this context, a minimal account strategy may occur. The reasons for this may vary. From the literature it is known that people adopt minimal accounts because "this strategy simplifies evaluation and reduces cognitive strain, reflects the intuition that consequences should be causally linked to acts, and matches the properties of hedonic experience, which is more sensitive to desirable and undesirable changes than to steady states" (Tversky and Kahneman 1981, p. 457).

We associate the minimal accounting strategy with the use of a simple heuristic known as "take-the-best", which operates lexicographically by identifying the cue with the highest priority. In our examples, "time saving" represents the most relevant feature to consider. It is an element that can simplify the decisional path for our participants, thus making all the other elements available for more analytical decisions. In short, the participants considered time for health particularly relevant and did not want to waste it. Time associated with personal health is likely to be considered precious and emotionally meaningful. When an option evokes

strong emotions, our mental strategies are impacted by the "choosing-by-liking" model (Frederick, 2002), where what we like is also what we consider to be relevant and significant to our life.

The results of the two experiments highlighted the role of subjective components in the decision-making process, particularly those in the motivational system (Baldi et al., 2013). It has been shown that an equivalence exists between "desires" and "beliefs". In such a context, the person comes to believe (judgment level) what they wish (volitional level). In other words, people tend to choose what they hope will be the case. In our experiments time saving was the most desirable attribute (reason) and therefore people expressed their choice based on this. This awareness forms the basis of so-called "wishful thinking" (Lerner and Dacher, 2000; 2001).

We found that people make decisions using a very scant and easy decisional tree, as described by the ecological paradigm (Todd and Gigerenzer, 2012). Specifically, people adopt a "take-the-best" heuristic. This heuristic involves estimating which of two alternatives has higher value on a criterion. Thus, where cues are ordered by cue validity (highest to lowest), a choice is made based on the first cue that discriminates between the alternatives. In our case, the first cue is represented by "time saving". In the original formulation, the cues were assumed to have either binary values (yes or no) or unknown values. Gigerenzer and Goldstein (1996) found that this heuristic was surprisingly effective at making accurate inferences in real-world environments, such as inferring which of two cities is larger. In our experiment, the "take-the-best" heuristic provides an accurate inference when choosing the medical product or medical service.

When evaluating cues, people assess their utility (Cipresso et al., 2015). The term "utility" is used in economics to denote subjective sensations – satisfaction, pleasure, wish-fulfilment, and cessation of need – all of which are derived from consumption (Katsikopoulos, 2011). However, the term is used slightly differently in relation to decision making as it is used to measure the attractiveness, goodness, or preferences of values and, consequently, of an alternative. When comparing and choosing alternatives, people therefore assign utility, even to costs (Gravelle and Rees, 2004). The crucial step is to decide which alternative is better and preferable to others, rather than expressing the utility in exact numbers (although, to calculate the optimal alternative for most methods, it is necessary to work with numbers). In our experiments, utility was not re-

lated to lower or higher costs, nor to higher discount prices, but to the value of "saving time" which leads people to choose the most important lexicographical cue (Martignon and Hoffrage, 2002). This reveals a preference for frugality and the use of a "less-is-more" cognitive heuristic (Riva et al., 2011; Riva et al., 2012; Todd and Gigerenzer, 2012).

Simple heuristics, originally introduced by Gigerenzer and Goldstein (1996), have been recognised for their precise specification of information search-stop and decision-making processes, as well as their psychological plausibility. This study broadened the existing body of evidence and showed that simple heuristics can capture human decision making and thus determine the topical accounting of mental representations (Riva et al., 2014).

The present study has some limitations. First, participants presented high medical literacy being university students in health disciplines. Future studies should replicate this study with laypeople with different ages and health literacy. Second, the current research did not investigate other potential factors impacting on the final decision, such as the role of motivation. Any decision, although quick, is influenced by our own values and beliefs or, more technically, by our remembered utilities and anticipated utilities (Kahneman, Wakker and Sarin, 1997). Future investigations should also cover this analysis together with individual expectations.

Despite these limitations, the results of this investigation offer a new reading of a classical experiment within a medical context and they suggest new avenues of research at theoretical and practical level. At theoretical level, these findings indicate the need for a dialogue between classical studies and traditional theoretical models of bounded rationality and more recent theories of ecological rationality where the decision maker is not only an agent subject to his/her biases and fallacies but an adaptive agent able to "take the best" solution in each context. The studies we carried out also suggest to enhance the dialogue between the two paradigms (Chater et al., 2018; Hertwig and Hoffrage, 2001), which are not rarely opposed to each other, because it can give very interesting hints to decision process analysis and models interpretation.

At practical level, these findings suggest new inputs to support citizens' involvement in health decisions. Considering the decisional path in health context as quick and impactful can be pivotal for the correct design of web sites and other electronic information sources proving information on health management, for the creation of personalized compute-

r-based information and virtual support as well as for purposive training for health professionals in communication skills, decision aids for patients and self-management education programmes.

Conflicts of Interest

The authors declare that they have no conflict of interest.

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